

REMARKS

This amendment is being filed in response to the office action dated June 29, 2006. In that office action, the Examiner withdrew his previous election of species requirement in favor of a restriction requirement, and rejected claims 30-43 under 35 USC §103(a) for being unpatentable over various prior art combinations.

Election / Restriction Requirement –

As indicated above, a previous election of species requirement was withdrawn in the last office action in favor of a related restriction requirement. Furthermore, the Applicant acknowledges that the corresponding information provided in the last office action was for the purpose of clarifying the record and that no additional response, with respect to the restriction, is required by the Applicant.

Claims 30, 31, 35-38, 42 and 43 –

Claims 30, 31, 35-38, 42 and 43 stand rejected under 35 USC §103(a) for being unpatentable over US Patent No. 6,265,816 (Ito) in view of US Patent No. 4,700,103 (Yamaguchi). For at least the reasons stated below, the Applicant respectfully traverses this rejection and asks that the Examiner reconsider it and allow the pending claims.

First, neither Ito nor Yamaguchi discloses or even suggests a “center electrode ... having a main shank portion with a diameter (H), a first radially reduced portion having a diameter (I), and a collar section having an end face with a recess... wherein  $2.5mm \leq H \leq 3mm$  and  $2.25mm \leq I \leq 3mm$ ,” as called for in amended claim 30. In the last office action, it was reasoned that Ito discloses the center electrode dimensions (H) and (I) because “[t]he size of the two portions are determined by the insulating bore and are between 2-5mm and 1-3.5mm respectively.”<sup>1</sup> The Applicant interprets this reasoning as follows, because Ito discloses a first portion (6a) of an insulator through hole with an inner diameter (D<sub>7</sub>) that is 1 to 3.5mm and a second portion (6b) with an inner diameter (D<sub>6</sub>) that is 2 to 5mm, then Ito discloses a center electrode having a main

shank portion diameter (H) and a first radially reduced portion diameter (I) with the claimed diameters. If this interpretation is correct, then the Applicant respectfully disagrees with this logic as Ito makes absolutely no mention of center electrode dimensions (H) and (I). Assuming arguendo that Ito includes a center electrode with a main shank portion and a first radially reduced portion located in through hole (6), the only relevant inference that can be drawn is that those center electrode portions located within the insulator are smaller than the through hole's inner diameter. There is nothing within the teachings of Ito that suggests that the main shank portion has a diameter (H) where  $2.5\text{mm} \leq H \leq 3\text{mm}$  and a first radially reduced portion having a diameter (I) where  $2.25\text{mm} \leq I \leq 3\text{mm}$ . Therefore, while the Ito patent may disclose several ranges for the insulator through hole inner diameter, it does not disclose any dimensions for the claimed center electrode portions.

Second, the spark plug described in Ito does not include a center electrode having both a main shank portion and a radially reduced portion *located at a lower axial end of the spark plug*, as called for in amended claim 30. In the previous office action the Examiner stated, "The center electrode includes a main shank portion located inside the insulator bore ( $D_6$ ) and a first radially reduced portion located inside the insulator bore ( $D_7$ )."<sup>1</sup> However, referring to FIG. 1 of the Ito patent, it is clear that the only portions of center electrode 3 that are located within insulator bore section  $D_6$  are an electrode-fixing protrusion portion 3c (which appears to simply be a radially-increased rivet section) and a short stem extending therefrom. These are not located at the lower axial end of the plug. Insulator bore section  $D_6$  is instead designed to receive terminal 13, conductive glass seal layers 16 and 17, and resistor 15, as stated below:

Then, the through hole 6 of the insulator 2 has a generally cylindrical first portion 6a which allows the center electrode 3 to be inserted through, and a generally cylindrical second portion 6b formed on the rear side (upper side in the figure) of the first portion 6a so as to be larger in diameter than the first portion 6a. *The terminal 13 and the resistor 15 are contained in the second portion 6b, and the center electrode 3 is inserted into the first portion 6a.<sup>2</sup>* (Emphasis added.)

Accordingly, the cited dimensions of upper insulator portion 6b of Ito do not correspond to any of the center electrode dimensions recited in amended claim 30.

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<sup>1</sup> Office action dated June 29, 2006; page 4

<sup>2</sup> US Patent No. 6,265,816; col. 10, lines 37-44

Third, the deficiencies of the Ito disclosure are not remedied by the teachings in Yamaguchi. More specifically, Yamaguchi fails to disclose a center electrode having a main shank portion, a first radially reduced portion, *and a collar section* having an end face with a recess. In each of the Yamaguchi embodiments, there is shown a center electrode 4 that includes a center electrode main body 4-1 having an end surface 4-1a with a recess 11. In this arrangement, there is no collar section surrounding a noble metal tip; rather, there is only a recessed surface at the end of the taper that connects section 4-1 with surface 4-1a. The structural differences between the non-collared center electrode 4 taught in Yamaguchi and the collared center electrode recited in claim 30 not only impact the electrode's ability to retain the noble metal tip during extreme operating conditions, but also impact the selection of noble metal tip attachment techniques that can be used. As explained in the present application, it is anticipated that certain structural characteristics of the collar section may change during the process of noble metal tip attachment. Therefore, it should be appreciated that even if a particular spark plug undergoes changes to its collar section or other section during a manufacturing process, it can still embody the subject matter recited in amended claim 30.

Amended claim 37 calls for a spark plug having a shell outer thread diameter of about 12mm and a dimensional combination that is neither disclosed nor suggested by Ito and/or Yamaguchi. For reasons similar to those articulated above (the dimensions of claim 37 differ somewhat from those of claim 30), the Applicant respectfully traverses the rejection of amended claim 37 on the basis of Ito in view of Yamaguchi.

In view of these reasons, the Applicant respectfully asks the Examiner to reconsider this rejection and allow pending claims 30, 31, 35-38, 42 and 43.

Claims 32-34 and 39-41 –

Claims 32-34 and 39-41 stand rejected under 35 USC §103(a) for being unpatentable over Ito in view Yamaguchi and in further view of US Patent No. 6,262,522 (Osamura). The Applicant respectfully traverses this rejection and asks that the Examiner reconsider it and allow these claims.

Claims 33 and 40 call for a “...noble metal tip has a diameter (K), *wherein*  $0.5\text{mm} \leq K \leq 0.9\text{mm}$ .” This diametric range, when taken in the context of the specific combination of features recited in claims 33 and 40, is desirable in that it improves the areas of spark plug performance, manufacturability and durability. It should be pointed out that the Applicant makes no specific claim to a noble metal tip having a diameter (K) where  $0.5\text{mm} \leq K \leq 0.9\text{mm}$  by itself. It is only in combination with the other features of claims 33 and 40, that the true benefit and superiority of this dimension is appreciated, as there is a tremendous amount of interplay between the different spark plug dimensions that results in the claimed plug being greater than the sum of its parts. The relatively small diametric range of  $0.5\text{mm} \leq K \leq 0.9\text{mm}$ , when used in conjunction with the spark plug recited in claims 33 and 40, results in myriad advantages over prior art tips. For instance, the use of a noble metal tip in the claimed spark plug construction successfully addresses several major design considerations and challenges, including those directed to laser attachment processes, thermal management of the noble metal tip, and resistance to electrical erosion and chemical corrosion, to name but a few.

Therefore, even though Osamura discloses a broad range for the outer diameter (A) of a noble metal chip (5) that encompasses the diametric range called for in claims 33 and 40, it does not do so with the specificity required to make the claimed range obvious. This is particularly true considering the fact that the only specific noble metal chip diameter provided in Osamura is  $1.0\text{mm}^3$ , which falls outside of the claimed range. Accordingly, the situation is even distinguishable from that described in MPEP §2131.03, which states that a case by case determination must be made when the prior art discloses a range which touches or overlaps a claimed range, but provides no specific examples that fall within the claimed range. In this instance, Osamura does provide a specific example; a specific example that falls outside of the claimed range.

For at least the reasons provided above, the Applicant respectfully asks the Examiner to reconsider this rejection and allow pending claims 32-34 and 39-41.

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<sup>3</sup> US Patent No. 6,262,522; col. 4, lines 8-19

Claims 44-45 –

Newly added claims 44 and 45 further require a collar section having a diameter (J), where  $0.75\text{mm} \leq J \leq 1.75\text{mm}$ . In addition to the previously articulated reasons, the cited prior art fails to disclose a spark plug as here defined. Thus, the Applicant respectfully requests allowance of these new claims.

Conclusion –

In view of the foregoing, the Applicant respectfully submits that all claims are in condition for allowance and therefore requests reconsideration. The Examiner is invited to telephone the undersigned if doing so would advance prosecution of this case.

The Commissioner is hereby authorized to charge Deposit Account No. 50-0852 for a one-month extension of time, as well as any other required fees, or to credit any overpayment associated with this communication.

Respectfully submitted,

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